CETIFICATION

SDG No:

MC48032

Humacao, PR

Laboratory:

Accutest, Massachusetts

Site:

BMS, Building 5 Area, PR

Matrix:

Groundwater

SUMMARY:

Groundwater samples (Table 1) were collected on the BMSMC facility – Building 5 Area. The BMSMC facility is located in Humacao, PR. Samples were taken September 22-23, 2016 and were analyzed in Accutest Laboratory of Marlborough, Massachusetts that reported the data under SDG No.: MC48032. Results were validated using the following quality control criteria of the methods employed (MADEP VPH and MAPED EPH, Massachusets Department of Environmental Protection, 2004) and the latest validation guidelines (July, 2015) of the EPA Hazardous Waste Support Section. The analyses performed are shown in Table 1. Individual data review worksheets are enclosed for each target analyte group. The data sample organic data samples summary form shows for analytes results that were qualified.

In summary the results are valid and can be used for decision taking purposes.

Table 1. Samples analyzed and analysis performed

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC48032-1	MW-11	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-2	MW-23	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-3	MW-22	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-4	MW-16	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-5	MW-9	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-6	MW-19	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-7	MW-18	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-8	EB-092316	AQ – Equipment Blank	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-9	MW-21S	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-9D	MW-21S MSD	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC48032-9S	MW-21S MS	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges

Reviewer Name:

Rafael Infante

Chemist License 1888

Signature:

Date:

October 15, 2016

Signature Signat

Page 1 of 1

SGS Accutest LabLink@169383 09:23 14-Oct-2016

Report of Analysis

Client Sample ID: MW-11 Lab Sample ID:

MC48032-1

Matrix:

AQ - Ground Water

Mcthod: Project:

MADEP VPH REV 1.1

BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/22/16

Q

J \mathbf{JB} JB'

Date Received: 09/28/16

Percent Solids: n/a

Run #1 WX77705.D 1 09/30/16 AF n/a n/a GWX3845 Run #2	Run #1	File ID WX77705.D	DF 1	Analyzed 09/30/16	By AF	Prep Date	Prep Batch n/a	Analytical Bate GWX3845
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Purge Volume

Run #1 Run #2 5:0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.) C5- C8 Aliphatics C9- C12 Aliphatics	14.9 8.6 14.6 12.3 ND	50 50 50 50 50	8.8 8.0 9.7 8.8 8.0	ug/l ug/l ug/l ug/l ug/l
CAS No.	Surrogate Recoveries	Run#1	Run# 2	Lim	its
	2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene	97% 97%			30% 30%



ND = Not detected

RL = Reporting Limit E = Indicates value exceeds calibration range J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Client Sample ID: MW-11 Lab Sample ID:

MC48032-1

AQ - Ground Water

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/22/16 Date Received: 09/28/16

Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE15764.D	1	10/11/16	TA	10/03/16	OP48826	GDE878
Run #2							

Matrix:

Method:

Project:

Initial Volume Final Volume 970 ml 2.0 mI

Run #1 Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	43.2	100	30	ug/l	JB
	C9-C18 Aliphatics	57.7	100	17	ug/I	JB
	C19-C36 Aliphatics	66.3	100	28	ug/l	JB
	C11-C22 Aromatics	43.2	100	30	ug/I	JB
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	99%		40-1	40%	
321-60-8	2-Fluorobiphenyl	89%		40-1	40%	
3386-33-2	1-Chlorooctadecane	80%		40-1	40%	
580-13-2	2-Bromonaphthalene	81%		40-1	40%	



MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Méndez

Report of Analysis

Page I of 1

Client Sample ID: MW-23 Lab Sample ID:

MC48032-2

Matrix: Mcthod:

Project:

AQ - Ground Water

MADEP VPH REV 1.1

BMSMC, Building 5 Area, Puerto Rico

Date Sampled:

09/22/16 Date Received: 09/28/16

Percent Solids: n/a

File ID DF Analyzed By Prep Date Prep Batch Analytical Batch Run #1 WX77706.D 1 09/30/16 AF n/a n/a GWX3845 Run #2

Purge Volume Run #1 5.0 ml

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	8.8	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	14.3	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	-
	C9- C12 Aliphatics	ND	50	8.0	ug/I	
CAS No.	Surrogate Recoveries	Run#1	Run# 2	Lim	its	

2,3,4-Trifluorotoluene 97% 70-130% 2,3,4-Trifluorotolucne 96% 70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page I of 1

Client Sample ID: MW-23 Lab Sample ID:

MC48032-2

Matrix: Method:

Project:

AQ Ground Water

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 09/22/16

Q

JB JB JB JB

Date Received: 09/28/16

Percent Solids: n/a

Run #1	File ID DE15765.D	DF 1	Analyzed 10/11/16	By TA	Prep Date 10/03/16	Prep Batch OP48826	Analytical Batch GDE878
Run #2							

Initial Volume Final Volume

 $2.0 \, \mathrm{ml}$

Run #1 Run #2 900 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	37.7 30.3 51.3 37.7	110 110 110 110	32 19 30 32	ug/l ug/l ug/l ug/l
CAS No.	Surrogate Recoveries	Run#1	Run# 2	Limi	its
84-15-1 321-60-8 3386-33-2 580-13-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene	111% 89% 75% 94%		40-1- 40-1- 40-1- 40-1-	40% 40%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank N = Indicates presumptive evidence of a compound

Report of Analysis

By

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Page 1 of 1

Client Sample ID: Lab Sample ID:

MW-22 MC48032-3

AQ - Ground Water

Matrix: Method:

DF

1

Project:

MADEP VPH REV 1.1

BMSMC, Building 5 Area, Puerto Rico

Analyzed

09/30/16

Date Sampled: 09/22/16

Date Received: 09/28/16

Percent Solids: n/a

Prep Batch

n/a

Prep Date

n/a

Analytical Batch

GWX3845

Run #1 Run #2

Purge Volume

WX77707.D

Run #1 Run #2 5.0 ml

File ID

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	8.9	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	8.3	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	16.6	50	9.7	ug/l	JB
	C5- C8 Aliphatics	8.9	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	_

CAS No.	Surrogate Recoveries	Run#1	Run# 2	Limits

2.3.4-Trifluorotoluene 96% 70-130% 2,3,4-Trifluorotoluene 97% 70-130%





MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank





Report of Analysis

Page 1 of 1

Client Sample ID: MW-22

Lab Sample ID:

MC48032-3

Matrix: Method:

Project:

Run #1

Run #2

AQ - Ground Water

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Date Sampled:

Q

JB JB JB JB 09/22/16

Date Received: 09/28/16 Percent Solids: n/a

File ID DF Analyzed By Prep Date Prep Batch Analytical Batch Run #1 DE15766.D 1 10/11/16 TA 10/03/16 OP48826 **GDE878** Run #2

Initial Volume Final Volume

940 ml

 $2.0 \, \mathrm{ml}$

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Unit
	C11-C22 Aromatics (Unadj.)	37.5	110	30	ug/l
	C9-C18 Aliphatics	54.3	110	18	ug/l
	C19-C36 Aliphatics	87.0	110	29	ug/l
	C11-C22 Aromatics	37.5	110	30	ug/l
CAS No.	Surrogate Recoveries	Run# I	Run# 2	Lim	its
84-15-1	o-Terphenyl	120%		40-1	40%
321-60-8	2-Fluorobiphenyl	106%		40-1	40%
3386-33-2	1-Chlorooctadecane	78%		40-1	40%
580-13-2	2-Bromonaphthalene	115%		40-1	40%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Ву

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Page 1 of 1

Client Sample ID: MW-16 Lab Sample ID:

MC48032-4

Matrix:

Method:

AQ - Ground Water

DF

1

Project:

MADEP VPH REV 1.1

Date Sampled: Date Received: 09/28/16

Prep Date

n/a

09/22/16

n/a

Percent Solids: n/a

BMSMC, Building 5 Area, Puerto Rico

Analyzed

09/30/16

Prep Batch Analytical Batch GWX3845

Run #1 Run #2

Purge Volume

WX77708.D

Run #1

5.0 ml

File ID

Run #2

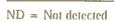
Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	14.2	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	17.5	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	26.7	50	9.7	ug/l	JB
	C5- C8 Aliphatics	14.2	50	8.8	ug/l	j
	C9- C12 Aliphatics	ND	50	8.0	ие/Т	_

CAS No. Surrogate Recoveries Run#1 Run# 2 Limits

2,3,4-Trifluorotoluene 98% 70-130% 2,3,4-Trifluorotoluene 97% 70-130%





MDL = Method Detection Limit



E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank N = Indicates presumptive evidence of a compound

By

TA

RL

Client Sample ID: Lab Sample ID:

MW-16 MC48032-4

Matrix:

AQ - Ground Water MADEP EPH REV 1.1 SW846 3510C Date Sampled: Date Received: 09/28/16

09/22/16

Percent Solids: n/a

Method: Project:

BMSMC, Building 5 Area, Puerto Rico

Run #1 Run #2 DF 1

Analyzed 10/11/16

Prep Date 10/03/16

Prep Batch OP48826

Analytical Batch **GDE878**

Initial Volume 900 ml

File ID

DE15767.D

Final Volume $2.0 \, \mathrm{ml}$

Run #1 Run #2

84-15-1

321-60-8

3386-33-2

580-13-2

Extractable TPHC Ranges

CAS No. Compound

> C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics

ND 31.4 51.7 ND

Result

Run#1

110 32 110 19 110 30 110 32

Run# 2

MDL

Limits

ug/l ug/l JB ug/l JB ug/I

Units

Q

CAS No. Surrogate Recoveries

> o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene

C11-C22 Aromatics

96% 81% 93% 86% 40-140% 40-140% 40-140% 40-140%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Page 1 of 1

Client Sample ID: Lab Sample ID:

MW-9 MC48032-5

Matrix:

AQ - Ground Water

Method: Project:

MADEP VPH REV 1.1

BMSMC, Building 5 Area, Puerto Rico

Date Sampled:

09/23/16 09/28/16

Date Received:

Percent Solids: n/a

File ID DF Analyzed By Prep Date Analytical Batch Prep Batch Run #1 WX77709.D 09/30/16 1 AF n/a GWX3845 n/a Run #2

Purge Volume

Run #1 Run #2 5.0 ml

Volatile TPHC Ranges

CAS No. Compound Result RL MDL Units Q C5- C8 Aliphatics (Unadj.) 9.2 50 8.8 ug/I J C9- C12 Aliphatics (Unadj.) 9.0 50 8.0 ug/l JB C9- C10 Aromatics (Unadj.) 16.2 50 9.7 ug/l JB C5- C8 Aliphatics 9.2 50 8.8 ug/I J C9- C12 Aliphatics ND 50 8.0 ug/l

CAS No. Surrogate Recoveries Run#1 Run#2 Limits

2,3,4-Trifluorotoluene 97% 70-130% 2,3,4-Trifluorotoluene 95% 70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank





Client Sample ID: MW-9 Lab Sample ID:

MC48032-5

Matrix: Method: AQ - Ground Water

Date Sampled: 09/23/16

Date Received: 09/28/16

Project:

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Percent Solids: n/a

Run #1

File ID DF DE15768.D 1

Analyzed 10/11/16

By TA Prep Date 10/03/16

Prep Batch OP48826

Analytical Batch **GDE878**

Run #2

Initial Volume Final Volume

 $2.0 \, \mathrm{ml}$

Run #1 Run #2

Extractable TPHC Ranges

950 ml

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	ND 36.0 62.8 ND	110 110 110 110	30 18 29 30	ug/l ug/l ug/l ug/l	JB JB

	OII OUG / HOUMING.	110	110	Jo ug
CAS No.	Surrogate Recoveries	Run#1	Run# 2	Limits
84-15-1	o-Terphenyl	97%		40-140%
321-60-8	2-Fluorobiphenyl	85%		40-140%
3386-33-2	1-Chlorooctadecane	81%		40-140%
580-13-2	2-Bromonaphthalene	90%		40-140%
84-15-1 321-60-8 3386-33-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane	97% 85% 81%	Run# 2	40-140% 40-140% 40-140%





MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Page 1 of 1

Client Sample ID: MW-19 Lab Sample ID:

MC48032-6

AQ - Ground Water

Date Sampled:

Q

J

В

09/23/16

Matrix: Method: Project:

MADEP VPH REV 1.1

Date Received: 09/28/16

BMSMC, Building 5 Area, Puerto Rico

Percent Solids: n/a

		File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
	Run #1	WX77703.D	1	09/30/16	AF	n/a	n/a	GWX3845
	Run #2	WX77704.D	50	09/30/16	AF	n/a	n/a	GWX3845
- 1								

		Purge Volume
Run	#1	5.0 ml
Run	#2	5.0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C5- C8 Aliphatics (Unadj.)	9.1	50	8.8	ug/l
	C9- C12 Aliphatics (Unadj.)	7410 a	2500	400	ug/l
	C9- C10 Aromatics (Unadj.)	73.7	50	9.7	ug/l
	C5- C8 Aliphatics	ND	50	8.8	ug/l
	C9- C12 Aliphatics	729	50	8.0	ug/I
CAS No.	Surrogate Recoveries	Run#1	Run# 2	Lim	its
	2,3,4-Trifluorotoluene	100%	96%	70-1	30%
	2,3,4-Trifluorotoluene	100%	96%	70-1	30%

(a) Result is from Run# 2



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank N = Indicates presumptive evidence of a compound



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SGS Accutest LahLink@169383 09:23 14-Oct-2016

Report of Analysis

Client Sample ID: MW-19 Lab Sample ID:

MC48032-6

Matrix:

AQ Ground Water

Method: Project:

321-60-8

3386-33-2

580-13-2

MADEP EPH REV 1.1 SW846 3510C

BMSMC, Building 5 Area, Puerto Rico

Date Sampled:

Q

JB JB JB JB

40-140%

40-140%

40-140%

09/23/16 Date Received: 09/28/16

Percent Solids: n/a

Run #1 ^a	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #2	DE15769.D	1	10/11/16	TA	10/03/16	OP48826	GDE878

	Initial Volume	Final Volume
Run #1	310 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	
	C11-C22 Aromatics (Unadj.)	135	320	92	ug/l	
	C9-C18 Aliphatics	101	320	54	ug/l	
	C19-C36 Aliphatics	185	320	87	ug/l	
	C11-C22 Aromatics	133	320	92	ug/l	
CAS No.	Surrogate Recoveries	Run#1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	107%		40-1	40%	

80%

98%

88%

2-Bromonaphthalene (a) Elevated RL due to limited sample volume received.

2-Fluorobiphenyl

1-Chlorooctadecane



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Page 1 of 1

Client Sample ID: Lab Sample ID:

MW-18 MC48032-7

Matrix:

AQ - Ground Water

Method:

MADEP VPH REV 1.1

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

09/30/16

Date Sampled:

09/23/16

Date Received: 09/28/16

Percent Solids: n/a

Run #1 Run #2 File ID WX77711.D DF 1

By AF

RL

50

50

50

50

50

Prep Date n/a

MDL

8.8

8.0

9.7

8.8

8.0

Units

ug/I

ug/l

ug/l

ug/l

ug/I

Prep Batch n/a

Analytical Batch GWX3845

Purge Volume

Run #1 Run #2

CAS No.

5.0 ml

Volatile TPHC Ranges

CAS No. Compound

> C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.) C5- C8 Aliphatics

> > 2,3,4-Trifluorotoluene

2,3,4-Trifluorotoluene

C9- C12 Aliphatics Surrogate Recoveries

Run#1 98%

97%

Result

63.4

358

277

61.5

76.6

Run# 2

Limits 70-130% 70-130%

fact Infa Méndez

ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank N = Indicates presumptive evidence of a compound



Report of Analysis

Page I of 1

Client Sample ID: MW-18 Lab Sample ID:

MC48032-7

Matrix:

Method:

Project:

AQ Ground Water

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Date Sampled: Date Received:

09/23/16 09/28/16

Percent Solids: n/a

File ID DF Analyzed By Prep Date Prep Batch **Analytical Batch** Run #1 DE15770.D 1 10/11/16 TA 10/03/16 OP48826 **GDE878** Run #2

Initial Volume Run #1 940 ml

Final Volume $2.0 \, \mathrm{mI}$

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	263	110	30	ug/l	
	C9-C18 Aliphatics	39.6	110	18	ug/I	JB
	C19-C36 Aliphatics	55.6	110	29	ug/l	JB
	C11-C22 Aromatics	256	110	30	ug/I	В

		۵
Surrogate Recoveries	Run# 1 Run# 2	Limits
o-Terphenyl	90%	40-140%
2-Fluorobiphenyl	72%	40-140%
1-Chlorooctadecane	74%	40-140%
2-Bromonaphthalene	81%	40-140%
	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane	o-Terphenyl 90% 2-Fluorobiphenyl 72% 1-Chlorooctadecane 74%





MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Page 1 of 1

Client Sample ID: Lab Sample ID:

EB-092316 MC48032-8

AQ Equipment Blank

Matrix: Method:

MADEP VPH REV 1.1

DF

Date Sampled: Date Received:

09/23/16 09/28/16

Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

Prep Batch

Analytical Batch

Run #2

Run #1 WX77710.D

File ID

09/30/16 1

By AF

Prep Date n/a

n/a

JB

J

GWX3845

Purge Volume

Run #1

5.0 ml

Run #2

Volatile TPHC Ranges

CAS No. Compound Result RL MDL Units Q C5- C8 Aliphatics (Unadj.) 9.4 50 8.8 ug/I ĵ JB

C9- C12 Aliphatics (Unadj.) 8.7 50 8.0 ug/l C9- C10 Aromatics (Unadj.) 16.3 50 9.7 ug/l C5- C8 Aliphatics 9.2 50 8.8 ug/l C9- C12 Aliphatics ND 50 8.0 ug/l

CAS No. Surrogate Recoveries Run#1 Run#2 Limits

> 2,3,4-Trifluorotoluene 97% 70-130% 2,3,4-Trifluorotoluene 95% 70-130%





MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range



B = Indicates analyte found in associated method blank



Report of Analysis

By

TA

10/03/16

Page 1 of 1

GDE878

Client Sample ID: EB-092316 Lab Sample ID: MC48032-8

File ID

DE15771.D

AQ - Equipment Blank Method:

DF

1

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Analyzed

10/11/16

Date Sampled: 09/23/16 Date Received: 09/28/16

Percent Solids: n/a

OP48826

Prep Date Prep Batch **Analytical Batch**

Run #1 a Run #2

Matrix:

Project:

Initial Volume Final Volume Run #1 290 ml 2.0 mI

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	99.5 89.2 168 99.5	340 340 340 340	99 58 93 99	ug/l ug/l ug/l ug/l	JB JB JB
CAS No.	Surrogate Recoveries	Run#1	Run# 2	Lim	its	

	•		
84-15-1	o-Terphenyl	116%	40-140%
321-60-8	2-Fluorobiphenyl	91%	40-140%
3386-33-2	1-Chlorooctadecane	106%	40-140%
580-13-2	2-Bromonaphthalene	97%	40-140%

(a) Elevated RL due to limited sample volume received.



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Ву

AF

Prep Date

n/a

Page 1 of 1

Client Sample ID: MW-21S Lab Sample ID:

MC48032-9

Matrix:

Method:

AQ Ground Water MADEP VPH REV 1.1

DF

1

Project:

BMSMC, Building 5 Area, Puerto Rico

Date Sampled:

n/a

09/23/16

Date Received: 09/28/16

Prep Batch

Percent Solids: n/a

Analytical Batch GWX3845

Purge Volume

File ID

WX77700.D

Run #1

Run #1

Run #2

5.0 ml

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.) C5- C8 Aliphatics C9- C12 Aliphatics	ND 10.1 16.9 ND ND	50 50 50 50 50	8.8 8.0 9.7 8.8 8.0	ug/l ug/l ug/l ug/l ug/l	JB JB

Analyzed

09/30/16

CAS No.	Surrogate Recoveries	Run#1	Run# 2	Limits
	2,3,4-Trifluorotoluene	96%		70-130%
	2,3,4-Trifluorotoluene	95%		70-130%





MDL = Method Detection Limit

RL = Reporting Limit

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



E = Indicates value exceeds calibration range



Report of Analysis

Page 1 of 1

Client Sample ID: MW-21S

Lab Sample ID:

MC48032-9

Matrix: Method:

Project:

AQ - Ground Water

MADEP EPH REV 1.1 SW846 3510C

BMSMC, Building 5 Area, Puerto Rico

Date Sampled:

09/23/16

Date Received: 09/28/16

Q

JB JB JB JB

Percent Solids: n/a

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run #1 a	DE15742,D	1	10/07/16	TΛ	10/03/16	OP48826	GDE877
Run #2							

Initial Volume Final Volume

290 ml

2.0 ml

Run #1 Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	122 79.6 136 122	340 340 340 340	99 58 93 99	ug/l ug/l ug/l ug/l
CAS No.	Surrogate Recoveries	Run#1	Run# 2	Lim	its
84-15-1 321-60-8 3386-33-2 580-13-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene	104% 81% 97% 85%		40-1 40-1 40-1	40% 40%

(a) Elevated RL due to limited sample volume received.



ND = Not detected

RL = Reporting Limit E = Indicates value exceeds calibration range J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC48032

Account: AMANYWP Anderson Mulholland and Assoc.

Project: BMSMC, Building 5 Area, Puerto Rico

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC48032-9MS	WX77701.D	1	09/30/16	AF	n/a	n/a	GWX3845
MC48032-9MSD	WX77702.D	1	09/30/16	AF	n/a	n/a	GWX3845
MC48032-9	WX77700.D	1	09/30/16	AF	n/a	n/a	GWX3845

The QC reported here applies to the following samples:

Method: MADEP VPH REV 1.1 MC48032-1, MC48032-2, MC48032-3, MC48032-4, MC48032-5, MC48032-6, MC48032-7, MC48032-8, MC48032-9

CAS No.	Compound	MC48032-9 ug/l Q	Spike ug/l	MS MS ug/l %	S Spike ug/l	ug/l	MSD %	RPD	Limits Rec/RPD
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.)	ND 10.1 JB 16.9 JB	300 450 150	367 123 407 99 138 81	3 300 450 150	372 398 137	124 97 80	1 2 1	70-130/25 70-130/25 70-130/25
CAS No.	Surrogate Recoveries	MS	MSD	MC4803	32-9 Limi	ts			
	2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene	96% 97%	96% 96%	96% 95%	70-13 70-13				



Page 1 of 1

^{* =} Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC48032

Account: AMANYWP Anderson Mulholland and Assoc.

Project: BMSMC, Building 5 Area, Puerto Rico

File ID DE15743.D DE15744.D DE15742.D	DF 1 1	Analyzed 10/07/16 10/07/16 10/07/16	By TA TA TA	Prep Date 10/03/16 10/03/16 10/03/16	Prep Batch OP48826 OP48826 OP48826	Analytical Batch GDE877 GDE877 GDE877
	DE15743.D	DE15743.D 1	DE15743.D 1 10/07/16	DE15743.D 1 10/07/16 TA	DE15743.D 1 10/07/16 TA 10/03/16	DE15743.D 1 10/07/16 TA 10/03/16 OP48826
	DE15744.D	DE15744.D 1	DE15744.D 1 10/07/16	DE15744.D 1 10/07/16 TA	DE15744.D 1 10/07/16 TA 10/03/16	DE15744.D 1 10/07/16 TA 10/03/16 OP48826

The QC reported here applies to the following samples:

Method: MADEP EPH REV 1.1

Page 1 of 1

MC48032-1, MC48032-2, MC48032-3, MC48032-4, MC48032-5, MC48032-6, MC48032-7, MC48032-8, MC48032-9

CAS No.	Compound	MC480 ug/l	32-9 Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C11-C22 Aromatics (Unadj.)	122	JB	2670	2330	83	2860	2710	91	15	40-140/25
	C9-C18 Aliphatics	79.6	JB	1000	858	78	1070	914	78	6	40-140/25
	C19-C36 Aliphatics	136	JB	1330	1390	94	1430	1420	90	2	40-140/25

CAS No.	Surrogate Recoveries	MS	MSD	MC48032-9	Limits
84-15-1 321-60-8 3386-33-2 580-13-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene	99% 66% 111% 58%	107% 80% 104% 74%	81% 97%	40-140% 40-140% 40-140% 40-140%

⁽a) Elevated RL due to limited sample volume received.





^{* =} Outside of Control Limits.

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mc48032 PAGE __/OF /_

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VR 48032: Chain of Circlods Prine 1 of 3

EXECUTIVE NARRATIVE

SDG No: MC48032 Laboratory: **Accutest, Massachusetts**

Number of Samples: Analysis: MADEP VPH

Location: BMSMC, Building 5 Area

Humacao, PR

SUMMARY: Eleven (11) samples were analyzed for Volatiles TPHC Ranges by method MADEP

> VPH. Samples were validated following the METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (EVH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the

primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: None Major: None Minor: None

Critical findings: None **Major findings:** None

Minor findings: 1. Continuing and final calibration verification meets method specific

requirements except for the cases described in the Data Review Worksheet. No action taken % difference for C9-C12 Aliphatic

hydrocarbons was within method performance criteria.

2. Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

3. Analytes detected in equipment blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting

limits; results above the reporting limit/action level are retained.

COMMENTS: Results are valid and can be used for decision making purposes.

Rafael Infante **Reviewers Name:**

Chemist License 1888

Rafael Infant

Signature:

Date: October 15, 2016

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC48032-1

Sample location: BMSMC Building 5 Area

Sampling date: 9/22/2016

Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	14.9	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	8.6	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	14.6	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	12.3	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC48032-2

Sample location: BMSMC Building 5 Area

Sampling date: 9/22/2016

Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	8.8	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	14.3	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/22/2016

Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	8.9	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	8.3	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	16.6	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	8.9	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC48032-4

Sample location: BMSMC Building 5 Area

Sampling date: 9/22/2016

Matrix: Groundwater

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	14.2	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	17.5	ug/L	1	В	-	Yes
Ç9 - C10 Aromatics (Unadj.)	26.7	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	14.2	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	9.2	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.0	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	16.2	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	9.2	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC48032-6

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016 Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	9.1	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	7410	ug/L	50	-	J	Yes
Ç9 - C10 Aromatics (Unadj.)	73.7	ug/L	1	В	-	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	729	ug/L	1	-	J	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	63.4	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics (Unadj.)	358	ug/L	1	-	J	Yes
Ç9 - C10 Aromatics (Unadj.)	277	ug/L	1	-	-	Yes
Ç5 - C8 Aliphatics	61.5	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics	76.6	ug/L	1	-	J	Yes

Sample ID: MC48032-8

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: AQ - Equipment Blank

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	9.4	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	8.7	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	16	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	9.2	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	10.1	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	17	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC48032-9MS

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	367	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics (Unadj.)	407	ug/L	1	-	J	Yes
Ç9 - C10 Aromatics (Unadj.)	138	ug/L	1	-	-	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	372	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics (Unadj.)	398	ug/L	1	-	J	Yes
Ç9 - C10 Aromatics (Unadj.)	137	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

Type of validation	Full: X	Project Number:_MC48032
• •	Limited:	Date: 09/22-23/2016
		Shipping date: 09/27/2016
		Shipping date: 09/27/2016 EPA Region: 2
REVIEW OF	VOLATILE PETROLE	EUM HYDROCARBON (VPHs) PACKAGE
actions. This docume informed decision and assessed according to METHOD FOR THE I Massachusetts Depart validation guidelines p	ent will assist the revieud in better serving the the data validation guided DETERMINATION OF Nument of Environmental promulgated by the US dation actions listed on	organics were created to delineate required validation wer in using professional judgment to make more needs of the data users. The sample results were lance documents in the following order of precedence VOLATILE PETROLEUM HYDROCARBONS (VPH), I Protection, Revision 1.1 (2004). Also the general SEPA Hazardous Wastes Support Section. The QC the data review worksheets are from the primary
The hardcopied (lab received has been rev review for SVOCs inclu	riewed and the quality of	ntest_Laboratories data package control and performance data summarized. The data
No. of Samples: Field blank No.: Equipment blank No.: _	11 	Sample matrix:Groundwater
Field duplicate No.:	-	
X Data Comple X Holding Time N/A GC/MS Tunin N/A Internal Stand X Blanks X Surrogate Re X Matrix Spike/	teness es ig dard Performance	X Laboratory Control SpikesX Field DuplicatesX CalibrationsX Compound IdentificationsX Compound QuantitationX Quantitation Limits
	ments: _Volai ;_C9_to_C10_Aromatic	tiles_by_GC_by_Method_MADEP_VPH,_REV_1.1 s)
Definition of Qualifiers:		
J- Estimated results U- Compound not R- Rejected data UJ- Estimated north Reviewer: Augustian Date: 10/15/2016	detected	

	All criteria were met Criteria were not met and/or see below _	x
DATA COMPLETNES: A. Data Package:	S	
MISSING INFORMATION I	DATE LAB. CONTACTED DATE RECEIVED	
3. Other	Discrepan	ıcies:
3. Other	Discrepan	icies:
3. Other	Discrepan	acies:

All criteria were metX	
Criteria were not met and/or see below	

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE	DATE	DATE	ACTION
	SAMPLED	EXTRACTED	ANALYZED	
				·
Samples and	lyzed within met	hod recommende	d holding time. San	nole preservation
Samples and				ipic preservation
Samples and		vithin the required		
Samples and				ipic preservation

Criteria

Preservation:

Samples analyzed with ambient purge temperature: Samples must be acidified to a pH of 2.0 or less at the time of collection.

Samples analyzed with heated purge temperature: Samples must be treated to a pH of 11.0 or greater at the time of collection.

Methanol preservation of soil/sediment samples is mandatory. Methanol (purgeand-trap grade) must be added to the sample vial before or immediately after sample collection. In lieu of the in-field preservation of samples with methanol, soil samples may be obtained in specially-designed air tight sampling devices, provided that the samples are extruded and preserved in methanol within 48 hours of collection.

Holding times:

Aqueous samples using ambient or heated purge - analyze within 14 days. Soil/sediment samples - analysis within 28 days.

Cooler temperature	(Criteria: 4	<u>+</u> 2 °C):	_3°C
--------------------	--------------	-----------------	------

Actions: Qualify positive results/non-detects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).

If samples were not at the proper temperature (> 10°C) or improperly preserved, use professional judgment to qualify the results.

		C	All crit	eria were metX_ nd/or see below	
CALIBRAT	IONS VERIFIC	ATION			
Compliance requirements for satisfactory instrument calibration are established to ensur that the instrument is capable of producing and maintaining acceptable quantitative data.					
	Date of initial calibration:08/17/16				
Dates of initial calibration verification:08/17/16_					
Instrument ID numbers:GCWX					
Matrix/Level:AQUEOUS/MEDIUM					
DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED	
les i di		lib and a second second			
Initial and initial calibration verification meet method specific requirements					

Criteria- ICAL

- · Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be
 equal to or less than 25% over the working range for the analyte of interest. When
 this condition is met, linearity through the origin may be assumed, and the average
 calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range
 of interest. Calculate the collective CFs for C5-C8 Aliphatic Hydrocarbons and C9C12 Aliphatic Hydrocarbons using the FID chromatogram. Calculate the collective
 CF for the C9-C10 Aromatic Hydrocarbons using the PID chromatogram. Tabulate
 the summation of the peak areas of all components in that fraction against the total
 concentration injected. The %RSD of the calibration factor must be equal to or less
 than 25% over the working range for the hydrocarbon range of interest.

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples, and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than ±25%, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and

DATA REVIEW WORKSHEETS

percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects. If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration	08/17/16
Dates of continuing calib	oration verification:09/30/16
Dates of final calibration	verification:_08/17/16;_09/30/16
Instrument ID numbers:	GCWX
Matrix/Level:	AQUEOUS/MEDIUM

DATE	LAB FILE	ANALYTE	CRITERIA OUT	SAMPLES
	ID#		RFs, %RSD, <u>%D</u> , r	AFFECTED
		ration verification this document.	n meets method specifie	c requirements except
09/30/16	cc5211-50	rt7/10	-28.6	MC48032-1 to -9;
00/00/10	00021100	10710	-20.0	-9MS/-9MSD

Note: Results in the rt7/10 hydrocarbon range qualified as estimated (J) or (UJ) in affected samples.

A separate worksheet should be filled for each initial curve

All criteria were met _	
Criteria were not met and/or see below	_X

• percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects. If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:	08/17/16				
Dates of continuing calibration verification:09/30/16					
Dates of final calibration verification:_08/17/16;_09/30/16					
Instrument ID numbers:_	GCWX				
Matrix/Level:	AQUEOUS/MEDIUM				

DATE	LAB FILE	ANALYTE	CRITERIA OUT	SAMPLES			
	ID#		RFs, %RSD, <u>%D,</u> r	AFFECTED			
	Continuing and final calibration verification meets method specific requirements except						
for the case	es described in	this document.					
09/30/16	cc5211-50	rt7/10	-28.6	MC48032-1 to -9;			
				-9MS/-9MSD			

Note: No action taken, % difference for the C9-C12 Aliphatics hydrocarbon range within method performance criteria,

A separate worksheet should be filled for each initial curve

All criteria were met _	
Criteria were not met and/or see below	_X

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

ANALYZED	LAB ID	MATRIX	COMPOUND	UNITS
_	BLANKS MEET DWING:		THOD SPECIFIC	CRITERIA_EXCEPT_FOR_
_09/30/16	_GWX3845-MB	AQUEOUS_	` •	ics)11.3_ug/L cs)19.6_ug/L

Note: Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

Field/Trip/Equipment

A methanol trip blank or acidified reagent water trip blank **should** continually accompany each soil/sediment sample or water sample batch, respectively, during sampling, storage, and analysis.

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENT UNITS	RATION
_NO_TRIP/FI	ELD_BLANKS_	ASSOCIATE	D_WITH_THIS_[DATA_PACKA	GE
_09/30/16	_MC48032-8	Aq./low	C5-C8_Aliphati C9-C12 Alipha		9.4_ug/l _8.7_ug/l
			C9-C10_Aroma C5-C8_Aliphati	itics_(Unadj.)_	

Note: Analytes detected in equipment blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

All criteria were metX	
Criteria were not met and/or see below	

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

All criteria were met _	_X
Criteria were not met and/or see below	

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery. Matrix: solid/aqueous

SAMPLE ID	SURROGATE CON 2,3,4-Trifluorotoluer			ACTION
SURROGATE: _LIMITS	STANDARD_RECO	VERIES_WITH	IIN_LABORATOR	/_CONTROL
QC Limits* (Aque	•			
LL_to_UL QC Limits* (Solid		to	to	
LL_to_UL		to	to	

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 70% or more than 130%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) Percent moisture of associated soil/sediment sample is >25% and surrogate recovery is >10%; or
- (3) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

All criteria were metX	_
Criteria were not met and/or see below	

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- Matrix duplicate Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 70 130% of the true value. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range), but must be noted in the narrative if <30%.</p>

MS/MSD Recoveries and Precision Criteria	
Sample ID:_MC48032-9_MS/MSD	Matrix/Level:_Groundwater
List the %Rs, RPD of the compounds which do no	t meet the QC criteria.

Note: MS/MSD % recovery and RPD within laboratory control limits.

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

				Criteria w		ria were metX_ or see below
2.	MS/MSD -	- Unspiked Compe	ounds			
		ations of the unsp unspiked sample				% RSDs of these cate.
CO	MPOUND	CONCENTRA SAMPLE		MSD	%RPD	ACTION
	·			W.		
Crite	eria: None spe	cified, use %RSD	<u>≤</u> 50 as	profession	al judgment.	
Actio	ons:					
If the	e % RSD is no	, qualify the result ot calculable (NC) udgment to qualify	due to n	ondetect va		J). e, MS, and/or MSD,

A separate worksheet should be used for each MS/MSD pair.

	All criteria were met	Χ
Criteria were not	met and/or see below	

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION	
LCS_RE	COVERY_WITHIN_L	ABORATORY	/_CONTROL_LIM	TS	·
	-		····		

Criteria:

- * Refer to QAPP for specific criteria.
- * The spike recovery must be between 70% and 130%. Lower recoveries of nnonane are permissible (if included in the calibration of the C9-C12 aliphatic range). If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R criteria and the magnitude of the excedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? Yes or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

	All criter Criteria were not met and/or se	ia were met e belowN/A
IX.	FIELD/LABORATORY DUPLICATE PRECISION	
Sample	e IDs:	Matrix:

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION					
No field/laboratory duplicate analyzed with this data package. MS/MSD % recovery RPD										
used to assess precision. RPD within laboratory and validation guidance document criteria (± 50 %) for analytes detected above reporting limits.										

Criteria:

The project QAPP should be reviewed for project-specific information. RPD \pm 30% for aqueous samples, RPD \pm 50 % for solid samples if results are \geq SQL. If both samples and duplicate are <5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is $\geq 5x$ the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5x the SQL, use professional judgment to determine if qualification is appropriate.

All criteria were metX
Criteria were not met and/or see below

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

- 1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target VPH
 Analyte each time a new GC column is installed, and must be verified and/or
 adjusted on a daily basis.
 - o Coelution of the m- and p- xylene isomers is permissible.
 - o All surrogates must be adequately resolved from individual Target Analytes included in the VPH Component Standard.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

Note: Target analytes were within the retention time window.

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.

			All o Criteria were not met	criteria were metX and/or see below
XII.	QUANTITATION	ON LIMITS AND S	AMPLE RESULTS	
The s	ample quantitat	ion evaluation is to	verify laboratory quantitation	on results.
1.	•		a minimum of one sample	
MC48			PH (C9 – C12 Aliphatics)	RF = 2.135×10^4
FID	-		···(OS S.Z./iiipilados)	TW = 2.100 X 10
	145872)/(2.135	x 10 ⁴)		
[]=6	.83 ppb Ok			
MC48	032-6	VP	PH (C9 – C10 Aromatics)	RF = 1.257 x 10 ⁴
PID				
[]=(9	26484)/(1.257	x 10⁴)		
[]=7	3.7 ppb Ok			
2. (MDLs	If requested, v	rerify that the resul	its were above the laborator	y method detection limit
3.			SQLs elevated accordingly nation factor in the table below.	by the laboratory? List
S	AMPLE ID	DILUTION FAC	TOR REASON F	OR DILUTION
MC4	3032-6	50 X	Analyte over calibi	ation range
If diluti results	ion was not per	formed and the rected compounds. L	sults were above the conce ist the affected samples/con	ntration range, estimate mpounds:
			The state of the s	

EXECUTIVE NARRATIVE

SDG No: MC48032 Laboratory: Accutest, Massachusetts

Analysis: MADEP EPH Number of Samples: 11

Location: BMSMC, Building 5 Area

Humacao, PR

SUMMARY: Eleven (11) samples were analyzed for Extractables TPHC Ranges by method MADEP

EPH. Samples were validated following the METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets

are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: None Major: None Minor: None

Critical findings: None Major findings: None

Minor findings:

1. Analytes detected in method blank at a concentration below the

reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limit are qualified undetected.

limits; results above the reporting limit/action level are retained.

2. Analytes detected in equipment blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting

limits; results above the reporting limit/action level are retained.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: Rafael Infante

Chemist License 1888

Signature: Rafuel dufaut

Date: October 15, 2016

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC48032-1

Sample location: BMSMC Building 5 Area

Sampling date: 9/22/2016

Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	43.2	ug/L	1	JB	U	Yes
Ç9 - C18 Aliphatics	57.7	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	66.3	ug/L	1	JB	U	Yes
Ç11 - C22 Aromatics	43.2	ug/L	1	JB	U	Yes

Sample ID: MC48032-2

Sample location: BMSMC Building 5 Area

Sampling date: 9/22/2016

Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	37.7	ug/L	1	JB	U	Yes
Ç9 - C18 Aliphatics	30.3	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	51.3	ug/L	1	JB	U	Yes
Ç11 - C22 Aromatics	37.7	ug/L	1	JB	U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/22/2016

Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	37.5	ug/L	1	JB	U	Yes
Ç9 - C18 Aliphatics	54.3	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	87.0	ug/L	1	JB	U	Yes
Ç11 - C22 Aromatics	37.5	ug/L	1	JB	U	Yes

Sample ID: MC48032-4

Sample location: BMSMC Building 5 Area

Sampling date: 9/22/2016

Matrix: Groundwater

Analyte Name	Result	Units E	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	31.4	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	51.7	ug/L	1	JB	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	36.0	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	62.8	ug/L	1	JB	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	U	Yes

Sample ID: MC48032-6

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	135	ug/L	1	JB	U	Yes
Ç9 - C18 Aliphatics	101	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	185	ug/L	1	JB	U	Yes
C11 - C22 Aromatics	133	μσ/Ι	1	IB	П	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016 Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	263	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	39.6	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	55.6	ug/L	1	JB	U	Yes
Ç11 - C22 Aromatics	256	ug/L	1	В	-	Yes

Sample ID: MC48032-8

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: AQ - Equipment Blank

Analyte Name	Result	Units D	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	99.5	ug/L	1	JB	U	Yes
Ç9 - C18 Aliphatics	89.2	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	168	ug/L	1	JB	U	Yes
Ç11 - C22 Aromatics	99.5	ug/L	1	JB	U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	122	ug/L	1	JB	U	Yes
Ç9 - C18 Aliphatics	79.6	ug/L	1	JB	U	Yes
Ç19 - C36 Aliphatics	136	ug/L	1	JB	U	Yes
C11 - C22 Aromatics	122	ug/L	1	JB	U	Yes

Sample ID: MC48032-9MS

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016

Matrix: Groundwater

Analyte Name	Result	Units D	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	2670	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	1000	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	1330	ug/L	1	-	-	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 9/23/2016 Matrix: Groundwater

Analyte Name	Result	Units D	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	2860	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	1070	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	1430	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

Type of validation	Full:X Limited:	Date:Shipping date:_	:_MC48032 _09/22-23/2016 _09/27/2016 _2
REVIEW OF EXTR	RACTABLE PETROLE	UM HYDROCAF	RBON (EPHs) PACKAGE
validation actions. This of more informed decision were assessed according precedence METHOD HYDROCARBONS (VPI (2004). Also the general	document will assist the and in better serving to the data validation FOR THE DETERMED), Massachusetts Depart validation guidelines Contents and data validation.	reviewer in using the needs of the congression of t	created to delineate required professional judgment to make lata users. The sample results nents in the following order of EXTRACTABLE PETROLEUM mental Protection, Revision 1.1 ne USEPA Hazardous Wastes on the data review worksheets
The hardcopied (labor received has been revier review for SVOCs included)	wed and the quality con	t_Laboratories_ trol and performar	data package data summarized. The data
Lab. Project/SDG No.: No. of Samples: Field blank No.: Equipment blank No.: Trip blank No.: Field duplicate No.:	11 MC48032-8		
X Data Complete X Holding Times N/A GC/MS Tuning N/A Internal Standa X Blanks X Surrogate Rec X Matrix Spike/M	nrd Performance	X Laborator X Field Dup X Calibratio X Compour X Compour X Quantitat	olicates ons nd Identifications
Overall _Extractable_Petroleum (C9_to_C36_Aliphatics;			Comments: EP_EPH,_REV_1.1
Definition of Qualifiers:			
J- Estimated result U- Compound not of R- Rejected data UJ- Estimated nonde Reviewer:	letected		

	Criteria were not	All criteria were metx met and/or see below
I. DATA COMPLETNE A. Data Packag		
MISSING INFORMATION	DATE LAB. CONTACTED	DATE RECEIVED
B. Other		Discrenancies:
B. Other		Discrepancies:
3. Other		Discrepancies:
3. Other		
3. Other		
3. Other		
B. Other		

All criteria were met	X
Criteria were not met and/or see below	

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE	DATE	DATE	ACTION
	SAMPLED	EXTRACTED	ANALYZED	
Camples and				-1.0
Samples extra		ea within method ation within the re		olding time. Sample

Criteria

Preservation:

Aqueous samples must be acidified to a pH of 2.0 or less at the time of collection.

Soil samples must be cooled at 4 ± 2 °C immediately after collection.

Holding times:

Samples must be extracted within 14 days of collection, and analyzed within 40 days of extraction.

Cooler temperature	(Criteria: 4 + 2 °C):	3°C	

Actions: Qualify positive results/nondetects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ). If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R). If samples were not at the proper temperature (> 10°C) or improperly preserved, use professional judgment to qualify the results.

		Crite	All criteria eria were not met and/o	a were metX or see below
CALIBRAT	IONS VERIFIC	ATION		
Compliance the quantitative	at the instrum	s for satisfactory in ment is capable of	nstrument calibration producing and mai	are established to ntaining acceptable
Dat	e of initial calib	ration:08/05	5/16	
Dat	es of initial cali	bration verification:_	08/05/16	· · · · · · · · · · · · · · · · · · ·
Inst	rument ID num	bers:GCD	E	
Mat	rix/Level:	_AQUEOUS/MEDIUI	M	
DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
<u>Initi</u>	al and initial ca	libration verification	meet method specific i	requirements

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be
 equal to or less than 25% over the working range for the analyte of interest.
 When this condition is met, linearity through the origin may be assumed, and the
 average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C9-C18 Aliphatic Hydrocarbons, C19-C36 Aliphatic Hydrocarbons, and C11-C22 Aromatic Hydrocarbons using the FID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.
 - The area for the surrogates must be subtracted from the area summation of the range in which they elute.
 - The areas associated with naphthalene and 2-methylnaphthalene in the aliphatic range standard must be subtracted from the uncorrected collective C9-C18 Aliphatic Hydrocarbon range area prior to calculating the CF.

DATA REVIEW WORKSHEETS

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples or every 24 hours (whichever is more frequent), and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than ±25%, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects. If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:	08/05/16
Dates of continuing calib	oration verification:10/07/16;_10/11/16
Dates of final calibration	verification:10/07/16;_10/11/16
Instrument ID numbers:_	GCDE
Matrix/Level:	AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED				
Initial and continuing calibration meets method specific requirements. Closing calibration included in data package. Continuing and ending calibration meets method specific requirements.								

A separate worksheet should be filled for each initial curve

All criteria were met	
Criteria were not met and/or see below	Χ

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
			THOD SPECIFIC OCUMENT	CRITERIA_EXCEPT_IN_
_10/07/16	OP48826-ME	Aq./low	C11-C22_Aromati	ics_(Unadj.)38.1_ug/l
			C9-C18_Aliphatic	s27.5_ug/l
			C19-C36_Aliphati	cs53.6_ug/l
			C11-C22_Aromat	ics38.1_ug/l

Note: Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

Field/Trip/Equipment

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
_NO_TRIP/FIE _PACKAGE	ELD_BLANKS_	_ANALYZED_	_ASSOCIATED_V	VITH_THIS_DATA
10/11/16	MC48032	Aq./low		atics(Unadj.)99.5_ug/l tics89.2_ug/l
				atics168_ug/l

Note: Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB. Sample results below the reporting limit are qualified undetected (U) at the reporting limits; results above the reporting limit/action level are retained.

All criteria were met	X
Criteria were not met and/or see below	

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

	All criteria were met	X
Criteria were not	met and/or see below	

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery. Matrix: solid/aqueous

SAMPLE ID	SURROG S1	S2	IND S3	S4	ACTION
SURROGATE _LIMITS	_STANDAR	DS_RECOVER	RIES_WITHII	N_LABORAT	ORY_CONTROL
S1 = o-Terphen S3 = 1-Chloroo				orobiphenyl	40-140% ene 40-140%
QC Limits (%)* _LL_to_UL_ QC Limits* (Soli	40_to_140_	_40_to_140_		•	
_LL_to_UL_		to	to	to	

Note:

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 40% or more than 140%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

All criteria were met>	<u></u>
Criteria were not met and/or see below	

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- Matrix duplicate Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 40 140% of the true value. Lower recoveries of n-nonane are permissible but must be noted in the narrative if <30%.</p>

MS/MSD Reco	veries and Precision Cri	teria			
Sample ID:I	MC48032-9			Matrix/Level:_0	Groundwater_
List the %Rs, R	PD of the compounds v	vhich do no	t meet t	he QC criteria.	
MS OR MSD	COMPOUND	% R	RPD	QC LIMITS	ACTION

· <u> </u>					<u></u>
2.0					
		·			
	10000				

Note: MS/MSD % recoveries and RPD within laboratory control limits.

		Crite	ria were no	All criteria ot met and/or see	were met belowN/A
No action is taken of informed profession conjunction with other data. In those insta affect only the samp However, it may be a systematic proble associated samples.	al judgment, the office of the control of the contr	e data nd deter an be o qualificat ugh the I	reviewer mine the determined tion should MS/MSD r	may use the MS/ need for some qual that the results do be limited to thing results that the labor	/MSD results in alification of the of the MS/MSD s sample alone.
2. MS/MSD – U	nspiked Compo	unds			
List the concentratio compounds in the ur	ns of the unspik spiked sample,	ed comp matrix s	oounds an pike, and	nd determine the % matrix spike duplic	6 RSDs of these cate.
COMPOUND	CONCENTRA SAMPLE	TION MS	MSD	%RPD	ACTION
					
-				<u></u>	
Criteria: None specifi	ied, use %RSD	≤ 50 as _l	profession	al judgment.	
Actions:					
If the % RSD > 50, q If the % RSD is not MSD, use profession	calculable (NC)	due to	nondetect	value in the sam	

A separate worksheet should be used for each MS/MSD pair.

			Criteria		and/or see below	
	VIII.	LABORATORY CON	TROL SAMPLI	E (LCS/LCSD) ANALYSIS	
matric		ata is generated to de	termine accura	cy of the anal	ytical method for variou	S
	1.	LCS Recoveries Crite	eria			
		List the %R of compo	ounds which do	not meet the	criteria	
LCS I)	COMPOUND	% R	QC LIMIT	ACTION	
LCS	S_REC	OVERY_WITHIN_LAB	ORATORY_CO	ONTROL_LIM	TS	
	Criteria *	Refer to QAPP for sp The spike recovery m n-nonane are permis	nust be betweensible. If the rec	covery of n-no	0%. Lower recoveries on the contract of the co	е
	Action Action that ar the crit	s on LCS recovery slee outside the %R and	nould be based RPD criteria a	d on both the nd the magnit	number of compound ude of the excedance of	s f
the ass If the s for the If more qualify	sociated %R of tagged affected than h	d samples and accept he analyte is < LL, que d analyte in the assocital alf the compounds in itive results as (J) and	nondetects. lalify all positive lated samples. the LCS are no	e results (j) an	or the affected analyte in and reject (R) nondetect equired recovery criteria I target analyte(s) in the	5
2.	Freque	ency Criteria:				
per ma If no, t the eff	itrix)? <u>Y</u> he data ect and	<u>'es</u> or No. may be affected. Use	e professional j gly. Discuss ar	judgment to d	etermine the severity o	f

	Criteria were no	All criteria were me ot met and/or see below	
IX.	FIELD/LABORATORY DUPLICATE PRECISION		
Sampl	e IDs:	Matrix:	

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
No field/laboratory	duplicate	analyzed with this	data package. MS/N	ISD % r	ecovery RPD
			tory and validation gesize concentration ≥ 5		document

Criteria:

The project QAPP should be reviewed for project-specific information. RPD \pm 30% for aqueous samples, RPD \pm 50 % for solid samples if results are \geq SQL. If both samples and duplicate are \leq 5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is $\geq 5x$ the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5x the SQL, use professional judgment to determine if qualification is appropriate.

All criteria were met	_X
Criteria were not met and/or see below	

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

- 1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target EPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - o The n-nonane (n-C9) peak must be adequately resolved from the solvent front of the chromatographic run.
 - o All surrogates must be adequately resolved from the Aliphatic Hydrocarbon and Aromatic Hydrocarbon standards.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

1a. Aliphatic hydrocarbons range:

- o Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for n-C9 and 0.01 minutes before the Rt for n-C19.
- Determine the total area count for all peaks eluting 0.01 minutes before the Rt for n-C19 and 0.1 minutes after the Rt for n-C36.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

1b. Aromatic hydrocarbons range:

- Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for naphthalene and 0.1 minutes after the Rt for benzo(g,h,i)perylene.
- o Determine the peak area count for the sample surrogate (OTP) and fractionation surrogate(s). Subtract these values from the collective area count value.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

	All criteria were metX Criteria were not met and/or see below
2.	If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.
3.	Breakthrough determination - Each sample (field and QC sample) must be evaluated for potential breakthrough on a sample specific basis by evaluating the % recovery of the fractionation surrogate (2-bromonaphthalene) and on a batch basis by quantifying naphthalene and 2-methylnaphthalene in both the aliphatic and aromatic fractions of the LCS and LCSD. If either the concentration or naphthalene or 2-methylnaphthalene in the aliphatic fraction exceeds 5% of the total concentration for naphthalene or 2-methylnaphthalene in the LCS or LCSD, fractionation must be repeated on all archived batch extracts.
	NOTE: The total concentration of naphthalene or 2 methylnaphthalene in the LCS/LCSD pair includes the summation of the concentration detected in the aliphatic fraction and the concentration detected in the aromatic fraction. _Comments:Concentration_in_the_aliphatic_fraction_< 5%_of_the_total
	_concentration_for_naphthalene_and_2-methylnaphthalene
4.	Fractionation Check Standard – A fractionation check solution is prepared containing 14 alkanes and 17 PAHs at a nominal concentration of 200 ng/µl of each constituent. The Fractionation Check Solution must be used to evaluate the fractionation efficiency of each new lot of silica gel/cartridges, and establish the optimum hexane volume required to efficiently elute aliphatic hydrocarbons while not allowing significant aromatic hydrocarbon breakthrough. For each analyte contained in the fractionation check solution, excluding n-nonane, the Percent Recovery must be between 40 and 140%. A 30% Recovery is acceptable for n-nonane.
	Is a fractionation check standard analyzed? Yes? or No?
	Comments: Not applicable.

	All criteria were metX
Criteria were no	t met and/or see below

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

In order to demonstrate the absence of aliphatic mass discrimination, the response ratio of C28 to C20 must be at least 0.85. If <0.85, this nonconformance must be noted in the laboratory case narrative.

The chromatograms of Continuing Calibration Standards for aromatics must be reviewed to ensure that there are no obvious signs of mass discrimination.

Is aliphatic mass discrimination observed in the sample?

Yes? or No?

Is aromatic mass discrimination observed in the sample?

Yes? or No?

1. In the space below, please show a minimum of one sample calculation:

JC48032-7

C19-C36 Aliphatics

RF = 72,590

[] = (1898359)/(72,590)

[] = 26.2 ug/ml Ok

JC48032-7

c11-c22 Aromatics

RF = 114,600

[] = (14183076)/(114,600)

[] = 123.8 ug/ml Ok

DATA REVIEW WORKSHEETS

- 2. If requested, verify that the results were above the laboratory method detection limit (MDLs).
- 3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

DILUTION FACTOR	REASON FOR DILUTION			
	-			
 				
-!				
	-			
-				
	DILUTION FACTOR			

If dilution was not performed, affected samples/compounds:		results	(J)	for th	ne affected	compounds.	List	the
	The State of	AC 402 MARK			· · · · · · · · · · · · · · · · · · ·			_